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# **Mediterranean Fruit Fly Cooperative Eradication Program**

## **Hyde Park, California**

### **Environmental Assessment, September 2001**

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## I. Need for the Proposal

The Mediterranean fruit fly or Medfly, *Ceratitis capitata* (Wiedemann) is a major pest of agriculture throughout many parts of the world. Because of its wide host range (over 250 species of fruits and vegetables) and its potential for damage, the Medfly represents a serious threat to U.S. agriculture. Although it has been introduced intermittently to the U.S. mainland several times since its first introduction in 1929, eradication programs have been implemented to prevent it from becoming a permanent pest on the U.S. mainland.

A permanent infestation of Medfly would be disastrous to agricultural production in California and the United States. Although established on the Hawaiian Islands, Medfly's unchecked presence on the U.S. mainland would result in widespread destruction of crops such as apricot, avocado, grapefruit, nectarine, orange, peach, and cherry. Commercial crops as well as home production of host fruits would suffer if Medfly were allowed to remain. Fruit that has been attacked by Medfly is unfit to eat because the Medfly larvae tunnel through the fleshy part of the fruit, damaging the fruit and subjecting it to decay from bacteria and fungi.

On June 21, 2001 and August 29, 2001, mated female Medflies were trapped in the Hyde Park area of Los Angeles County, California. Subsequent to those finds, larval Medfly were found locally in fruit of host plants, confirming that an infestation exists. The infestation is presently found in a residential area of Los Angeles County, although that situation may change in the future. It is within the Preventive Release Program area. This area is primarily occupied by apartment buildings with limited Medfly host material.

The Medfly infestation detected in southern California represents a major threat to the agriculture and environment of California and other U.S. mainland States. The U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) and the California Department of Food and Agriculture (CDFA) are proposing a cooperative program to eradicate the Medfly infestation and eliminate that threat.

APHIS' authority for cooperation in the program is based upon the Organic Act (7 United States Code (U.S.C.) 147a), which authorizes the Secretary of Agriculture to carry out operations to eradicate insect pests, and the Plant Protection Act (Title 4 of the Agricultural Risk Protection Act of 2000), which authorizes the Secretary of Agriculture to use emergency measures to prevent the dissemination of plant pests new to or not widely distributed throughout the United States.

This site-specific environmental assessment (EA) analyzes the environmental consequences of alternatives which have been considered for Medfly control and considers, from a site-specific perspective, environmental issues that are relevant to this particular program. Alternatives for Medfly control have been discussed and analyzed comprehensively within the “Medfly Cooperative Eradication Program Final Environmental Impact Statement—1993” (EIS), which is incorporated by reference and summarized within this environmental assessment. Fruit fly chemical risk assessments (USDA, APHIS, 1998a, b) and risk assessments for spinosad (USDA, APHIS, 1999a, 1999b) have also been completed. Those documents are also incorporated by reference and summarized within this environmental assessment.

## **II. Alternatives**

Alternatives considered for this proposed program include (1) no action, (2) Medfly eradication (nonchemical control), and (3) Medfly eradication (integrated program). APHIS’ preferred alternative for the program is Medfly eradication (including chemicals), using an integrated pest management (IPM) approach. For more detailed information on the alternatives for Medfly control and their component methods, refer to the EIS and risk assessments.

## **III. Potential Environmental Consequences**

The analysis of potential environmental consequences will consider the alternatives of no action, nonchemical control, and an integrated program. Because the principal environmental concern over this program relates to its use of chemical pesticides, this assessment will focus on the potential environmental consequences of the pesticides on human health, nontarget species, and endangered and threatened species.

### **A. No Action**

Under the no action (no APHIS effort) alternative, Mediterranean fruit fly control would be left to the State, grower groups, or individuals. Without a coordinated efforts between APHIS and cooperators, it is likely that the Medfly infestation would spread to other areas of California and the U.S. mainland. Any response to control such an expanded infestation by individuals or organizations would probably result in a greater magnitude of environmental impact than would be associated with a coordinated APHIS/State eradication program. Under those

conditions, any available controls (including more hazardous chemical pesticides) could be used, resulting in greater environmental impact than is associated with the action alternatives analyzed within this assessment.

**1. Human Health**

Under the no action alternative, private homeowners and commercial growers would have few options other than pesticides to reduce the Medfly damage to their crops. Any pesticides registered for use could be applied in an unsupervised and uncoordinated manner. Accordingly, greater pesticide amounts and higher frequencies of application are likely to be used than would be expected with a coordinated, cooperative government program. In addition to the direct toxic effects of those pesticides, humans could also be affected by cumulative impacts resulting from synergistic effects of combining various pesticides for use against Medfly. Human exposure to pesticides and resulting adverse consequences probably would be greater than if pesticides were applied in a cooperative government program. The spread of the Medfly infestation will reduce the amount of locally available produce and may restrict the fruit consumption of some members of the public. Some members of the public may depend upon this source of fruit as a substantial portion of their diet.

**2. Nontarget Species**

Broader pesticide use resulting from lack of APHIS effort to combat Mediterranean fruit fly would increase the pesticide load to the environment and, therefore, increase the probability of effects to nontarget species. The potential expansion and establishment of the pest also would have unknown effects on insect community structure and on predators in those systems.

**3. Endangered and Threatened Species**

Section 7 of the Endangered Species Act of 1973 (ESA) requires Federal agencies to consult with the U.S. Department of the Interior, Fish and Wildlife Service (FWS), if species listed or proposed for listing are likely to be adversely affected. The CDFA advised that the California Natural Diversity Database indicates that no endangered or threatened species reside within the current eradication zone. However, endangered and threatened species occur in other parts of Los Angeles County and parts of adjacent Orange county. If the program expands into other areas of those counties, and if there is a potential for affecting federally listed or proposed endangered and threatened species, APHIS will consult with FWS over protective measures that may be required. Further expansion of Mediterranean fruit fly's range would be likely to include endangered and threatened species habitats, with unquantified risk to those species from uncoordinated pesticide use under the no action alternative. No adverse impacts to endangered or threatened species would result directly from APHIS' implementation of the no action alternative.

## **B. Nonchemical Control**

The nonchemical control methods proposed for use under this alternative include sterile insect technique, physical control, cultural control, cold treatment, irradiation treatment, and vapor heat treatment. Although biological control and biotechnological control are being researched for development, these methods have not yet been proven efficacious or technologically feasible, so their potential environmental consequences are not analyzed.

### **1. Human Health**

Under the nonchemical control alternative, human health is not expected to be adversely affected. The sterile insect technique, physical control, and cultural control do not pose a risk to human health. The control program includes some regulatory treatments (cold treatments, irradiation, and vapor heat treatments) that occur in restricted access facilities and that are strictly supervised to ensure no effects occur to human health. In general, the use of nonchemical methods reduces substantially the need for chemical applications, thereby decreasing the magnitude of impact from chemical usage. The nonchemical control alternative may not be successful for larger infestations and the human health consequences of inadequate control could be comparable to the no action alternative if the infestation of Medfly expanded due to insufficient containment of the pest.

### **2. Nontarget Species**

The nonchemical techniques that may be employed could disturb nontarget species, due to noise or mere human presence. In general, little risk is associated with these disturbances. Sterile insect technique could have a positive effect, that of providing a food source to some insectivores. Nonchemical methods have the potential for less pesticide use than the other alternatives, but control and containment by this alternative depend upon low pest populations. If nonchemical methods were insufficient to eradicate a pest population, the ultimate expansion of the infestation could result in pesticide usage comparable to that of no action.

### **3. Endangered and Threatened Species**

Nonchemical methods should not directly impact endangered or threatened species. The FWS has determined that the sterile insect technique is compatible with endangered or threatened species. The nonchemical regulatory treatments are not made to these species or their critical habitats.

Cultural and physical control methods can affect some species through habitat disturbance, but consultation with U.S. Fish and Wildlife Service about the use of these methods within program areas is made prior to program action to ensure that no programs actions will affect the endangered or threatened species or their critical habitat.

## **C. Integrated Program (Preferred Alternative)**

The environmental consequences of nonchemical methods were discussed under the nonchemical control alternative and this information will not be repeated in this section. The components of the proposed program which potentially have the greatest impact on the environment are the chemical pesticides. Special registration procedures are required for pesticides used against exotic pests, such as the Medfly which is not native to this country. A section 18 (emergency) or section 24c (special local needs) exemption under the Federal Insecticide, Fungicide, and Rodenticide Act allows their use. The environmental consequences from the use of these pesticides (malathion, spinosad, diazinon, and methyl bromide) are discussed below. Because of the limited and restricted nature of these chemical control actions necessary in this program, it has been analyzed within the framework of an environmental assessment.

Three major factors influence the risk associated with pesticide use: fate of the pesticide in the environment, its toxicity to humans and nontarget species, and the exposure of humans and nontarget species to the pesticide. These factors will be evaluated for each of the chemicals analyzed.

### **1. Malathion Bait Spray**

#### **a. Fate**

Malathion is an amber-colored liquid that is combined with a protein bait to form a sticky spray. The formulation used in the program is 0.175 pounds of active ingredient per acre mixed with 9.6 fluid ounces of protein hydrolysate bait per acre, for both aerial and ground applications. The half-life of malathion in soil or on foliage ranges from 1 to 6 days; in water, from 6 to 18 days. Malathion bait spray is applied from the ground, generally as a spot treatment to individual trees, or from the air. Trees, shrubs, and other surfaces such as soil, roads, and ponds are likely to receive spray from aerial applications, although efforts are made to avoid directly spraying water bodies including the use of buffers. Malathion is generally of more concern in aquatic areas because of its high toxicity to aquatic organisms.

#### **b. Toxicity**

Malathion is an organophosphate that acts by inhibiting acetylcholinesterase. Mildly acutely toxic, malathion is classified by EPA as category III (Caution) based on oral, dermal, and inhalation exposure routes. Toxic effects from malathion may include headache, nausea, vomiting, blurred vision, weakness, and muscular twitching at high doses. In humans and other mammals, metabolism by one degradation pathway leads to the formation of malaoxon, a more potent



cholinesterase inhibitor than malathion. The more common degradation pathways yield nontoxic intermediates.

Although malathion has not been determined to be a carcinogen in rats, additional data on malathion and malaoxon are equivocal and studies are ongoing. EPA is currently reviewing the issue. More information is needed to determine the neurotoxicity of malathion (EPA, 1988). Malathion may have synergistic effects when used with other pesticides.

Oral doses of malathion are slightly to moderately acutely toxic to mammals and birds (table 1). Signs of poisoning are similar to the reactions of humans. Malathion is highly toxic to some forms of aquatic life, including invertebrates, amphibians, and fish (table 2). The EPA has established a chronic water quality criteria of 0.1 µg/L (micrograms per liter) for protection of freshwater and marine aquatic life. Fish kills that may have been associated with aerial malathion bait spray applications have been documented.

**Table 1. Acute Oral LD<sub>50</sub>s<sup>1</sup> for Selected Species Dosed with Malathion (mg/kg)<sup>2</sup>**

Mouse	720 - 4,060
Female rat	1,000
Male rat	1,375
Mallard	1,485
Pheasant	167

<sup>1</sup>LD<sub>50</sub> = Lethal dose for 50% of animals treated

**Table 2. Malathion 96-hour LC<sub>50</sub>s<sup>1</sup> for Selected Aquatic Species (µg/L)**

Tadpole	200
Rainbow trout	4.1 - 200
Bluegill	20 - 110
Daphnia	1 - 1.8
Stone flies	1.1 - 8.8

<sup>1</sup>LC<sub>50</sub> = Lethal concentration for 50% of animals treated

## **c. Exposure and Risk**

### **Human Health**

Potential exposure to humans is by dermal absorption, inhalation, or ingestion of residues. Due to the potential for aerial application of malathion bait spray, dermal absorption from direct application or contact with treated surfaces is the primary exposure route for the public. Public exposure from a ground malathion bait spray application will be smaller than exposure from an aerial application because less area is treated and less pesticide is used. Workers, such as ground applicators and the ground crew for aerial applications, may have inhalation exposure as well as dermal exposure.

Results of the quantitative risk assessment prepared for the Medfly Cooperative Eradication Program Environmental Impact Statement (EIS) suggest that exposures to pesticides from comparable program operations are not likely to result in substantial adverse human health effects. Residues on commodities or backyard fruits resulting from the malathion bait spray application are unlikely to greatly increase exposure to the consuming public. Malathion concentrations on vegetation estimated by the California Department of Health Services (Kizer, 1991) indicate that levels of malathion on vegetation are not likely to exceed the residue tolerance levels set by EPA. Residue tolerances for malathion on many food items are established (40 CFR 180.11) and most are 8 ppm (parts per million). The provisional acceptable daily intake is 0.02 mg/kg per day.

The human health risks of comparable treatments are evaluated quantitatively in the Medfly Cooperative Eradication Program EIS. Results suggest that exposure from normal program operations will not present a human health risk either to workers or the public. In addition, risks to humans have been analyzed qualitatively, with reliance on information from past fruit fly eradication programs in California. The exposure scenarios from previous fruit fly eradication efforts will not differ substantially from the current program.

### **Nontarget Species**

Malathion bait spray will kill insects other than the Medfly. Malathion is highly toxic to bees, and direct application to areas of blooming plants can be expected to result in a high bee kill. Although malathion is not phytotoxic, there could be potential indirect effects on plant populations due to lower pollination rates if bee or other pollinator populations are reduced. This is a concern of aerial application. Secondary pest outbreaks have occurred concurrently with the use of aerial

applications of malathion bait spray, but have not been determined conclusively to be associated with the applications. In 1981, fish kills also occurred from a similar treatment method. Since then, the State of California has instituted procedures to reduce the likelihood of fish kills. None have been known to occur from aerial applications of malathion bait spray since the procedures were implemented.

Terrestrial animals are exposed to malathion primarily through dermal and oral routes. Ingesting prey containing residues, rubbing against treated vegetation, and grooming contribute to total dose. Aquatic species can be exposed to direct application and runoff. Exposure of malathion bait spray by aerial application poses high risk to nontarget invertebrates and some aquatic species. Some insectivores may be affected. Ground application of malathion bait spray has far fewer environmental consequences because the treated area is smaller and delivery is more accurate. Fewer species would be exposed and thus the treatment poses less total risk to nontarget species than does aerial application.

### **Endangered and Threatened Species**

Although it was determined that no endangered or threatened species reside within the current program eradication zone, several endangered or threatened species are found in nearby areas of Los Angeles County and adjacent Orange County. If the program were to expand and if the range of federally listed species and the treatment area overlapped, protective measures may be required to protect species from adverse environmental consequences of the program. The species that may be affected by control efforts are dependent upon the control methods used (i.e., not all control methods affect all species equally). Thus, protective measures will vary depending on the control method being used and the species found within the treatment area.

Malathion bait spray is not selective for Medfly alone. Ingestion of bait/malathion and cuticular exposure to malathion by insects other than Medfly could result in their deaths. If their habitats overlapped with the program treatments, those species could be adversely affected by aerial application of malathion bait. Repeated aerial sprays of malathion bait generally would reduce insect numbers. Reduction of insect populations could reduce pollinator species for threatened and endangered plants, and would reduce potential food resources for endangered and threatened insectivores. Malathion is highly toxic to many aquatic species, both vertebrate and invertebrate, and spray drift could result in aquatic system disruption. The ecosystem is resilient enough to absorb some reduction in nontarget populations and the resultant food web effects, but the severity of the reductions would increase with increased applications of malathion. Many of the endangered and threatened

species are dependent upon aquatic habitats. Loss of a single individual of a listed species from program activities would be a violation of ESA. Thus, aerial application of malathion bait spray should be controlled both within the range of endangered and threatened insect-pollinated plants (especially annuals) and in aquatic habitats.

## **2. Spinosad Bait Spray**

### **a. Fate**

Spinosad is a mixture of macrocyclic lactones produced naturally by an actinomycete bacteria. The active ingredients in spinosad are spinosyn A and spinosyn D. The bait formulation includes sugars and attractants that are of low toxicity and do not contribute to the overall hazard, but these substances may decrease the rate of degradation, particularly photodegradation by blocking the penetration of sunlight. The actual concentration of spinosad used by the program in the bait spray formulation is very low (0.008%). Spinosad is registered for use on various crops and has permanent EPA-approved tolerances for some fruits (including citrus), nuts, vegetables, cotton, and meat.

Thorough risk assessments have been prepared for human health (USDA, APHIS, 1999a) and nontarget species (USDA, APHIS, 1999b) for spinosad bait spray applications. Information from those assessments is incorporated by reference into this document and is summarized here.

The hazards of spinosad to environmental quality are minimal. This is primarily a function of the environmental fate. Spinosad persists for only a few hours in air and water. The low vapor pressure of spinosad indicates that it is not volatile. The aerobic soil half-life of both spinosyn A and D is 14.5 days. The photolysis half-life in soil is 8.68 days for spinosyn A and 9.44 days for spinosyn D (Dow Agrosciences, 1998). Although spinosyn A is water soluble, the compound readily binds to organic matter and no leaching to groundwater is anticipated for either spinosyn. The spinosyns bind readily to organic matter on leaf surfaces also. The photodegradation of spinosad residues occurs readily on plants and tolerances on crops are not of great concern to EPA (EPA, 1998a). The rapid breakdown and lack of movement in the environment ensure that there will be no permanent effects on the quality of air, soil, and water for the program applications.

### **b. Toxicity**

Spinosad acts as a contact and stomach poison against insects and it is particularly effective against all stages of flies (Adan et al., 1996). The mode of toxic action of this compound against insects has been shown to relate to the widespread excitation

of isolated neurons in the central nervous system (Salgado et al., 1997). This is caused by persistent activation of nicotinic acetylcholine receptors and prolongation of acetylcholine responses. The symptoms of intoxication are unique and are typified by initial flaccid paralysis followed by weak tremors and continuous movement of crochets and mandibles (Thompson et al., 1995). The receptors affected by spinosyns in insects are not present or vital to nerve transmission in most other taxa, so toxicity to most other organisms is low. There have been no reported human illnesses from the manufacturing or pesticide applications of spinosad.

Acute hazards from exposure to spinosad are low to mammals by all routes of exposure. The acute oral LD<sub>50</sub> to rats is greater than 5,000 milligrams (mg) of spinosad per kilogram (kg) body weight (Dow Agrosiences, 1998; EPA, 1998a). The acute dermal LD<sub>50</sub> to rats is greater than 2,800 mg/kg. Primary eye irritation tests in rabbits showed slight conjunctival irritation. Primary dermal irritation studies in rabbits showed slight transient erythema and edema. Spinosad was not found to be a skin sensitizer.

Subchronic and chronic studies also indicate low hazard. The systemic NOEL for spinosad from chronic feeding of dogs was determined to be 2.68 mg/kg/day (EPA, 1998a). The LOEL for this study (8.22 mg/kg/day) was based upon vacuolated cells in glands (parathyroid) and lymphatic tissues, arteritis, and increases in serum enzymes. The regulatory reference values selected for spinosad are based upon this study applying a safety factor of 10 for occupational exposure to make allowance for inter-species variability. An additional safety factor of 10 was applied for general public exposure to make allowance for intra-species variability and potential for wider ranges in sensitivity in the general public than in the occupational population. A neuropathology NOEL of 46 mg/kg/day was determined for male rats. EPA has classified the carcinogenic potential of spinosad as Group E — no evidence of carcinogenicity based upon chronic studies of mice and rats (EPA, 1998b). There has been no evidence of mutagenic effects from spinosad. The reproductive NOEL from a 2-generation study of rats was determined to be 10 mg/kg/day (EPA, 1998a).

The primary active ingredients in spinosad are spinosyn factor A and spinosyn factor D. All other substances in the formulated products of spinosad are of lower toxicity. Spinosyns are relatively inert and their metabolism in rats resulted in either parent compound or N- and O- demethylated glutathione conjugates as excretory products (EPA, 1998a). Studies have found that 95% of the spinosad residues in rats are eliminated within 24 hours.

Acute oral doses of spinosad are very slightly toxic to mammals and practically nontoxic to birds (table 3). Spinosad is slightly to moderately toxic to fish and most aquatic invertebrates, but highly toxic to marine molluscs (table 4). Spinosad is of slight to moderate acute toxicity to algae.

**Table 3. Acute Oral LD<sub>50</sub>s<sup>1</sup> for Selected Species Dosed with Spinosad (mg/kg)<sup>2</sup>**

Rat	>5,000
Mouse	23,100
Shrew	3,400
Mallard	>2,000
Pheasant	>2,000

<sup>1</sup>LD<sub>50</sub> = Lethal dose for 50% of animals treated

**Table 4. Spinosad 96-hour LC<sub>50</sub>s<sup>1</sup> for Selected Aquatic Species (µg/L)**

Grass shrimp	9,760
Rainbow trout	30,000
Bluegill	5,900
Daphnia	92,600
Eastern oyster	295

<sup>1</sup>LC<sub>50</sub> = Lethal concentration for 50% of animals treated

## c. Exposure and Risk

### Human Health

Potential exposure to humans is by dermal absorption, inhalation, or ingestion of residues. Dermal contact with treated surfaces is the primary exposure route for the public. Public exposure from ground bait spray application is less than exposure from an aerial application because less area is treated and less pesticide is used. Workers, such as ground applicators and the ground crew for aerial applications, may have inhalation exposure as well as dermal exposure.

Results of the quantitative risk assessment prepared for spinosad bait spray applications suggest that potential exposures are not likely to result in substantial adverse human health effects. The highest potential occupational exposure was

determined to occur in the extreme exposure scenario for ground personnel. The margin of safety for these program workers is about 100-fold. The highest potential exposure to spinosad for the general public occurs in the extreme scenario of a child consuming contaminated runoff water. The margin of safety for this individual exceeds 1,000-fold. No adverse effects are anticipated to human health from spinosad bait spray applications, even under extreme or accidental exposure scenarios.

Risks to human health from spinosad bait spray applications were also analyzed qualitatively for some chronic and subchronic effects. Since EPA has determined that there is no evidence of mutagenicity or any carcinogenic potential for spinosad, these outcomes are not expected to be of any concern. Most of the potential outcomes tested in laboratory tests required much higher exposures than would be anticipated from program applications. Outcomes such as reproductive and developmental toxicity, teratogenicity, and neurotoxicity are highly unlikely to occur from exposures to program applications. Spinosad is not a skin sensitizer, but other immunotoxic responses could occur if allergic reactions or hypersensitive conditions exist. Based upon experience in past programs, it must be kept in mind that the source of any immunotoxic responses to exposure may relate to a reaction to the bait in the formulation rather than the pesticide.

## **Nontarget Species**

The estimated doses to wildlife are based on the environmental concentrations determined from exposure models and scenarios. These results are described in greater detail in the nontarget risk assessment (USDA, APHIS, 1999b). The exposure of nontarget organisms to spinosad from bait spray applications is lower than to malathion. As a result of low exposure and low toxicity, the potential for adverse effects is expected to be negligible to mammals, birds, reptiles, fish, and amphibians from spinosad bait spray applications. Unlike malathion (toxic to all organisms by all routes of exposure), the active ingredients in spinosad are only toxic to certain invertebrates primarily by dermal and oral exposure. Any invertebrate that is attracted to and feeds upon the spinosad bait will be affected, but most species are not attracted to the bait. A small number of phytophagous invertebrates (particularly Lepidoptera caterpillars) may be killed by consumption of residues on leaves from spinosad bait spray applications. Predatory invertebrates in treated areas are not expected to have much mortality. Although spinosad bait spray is not attractive to honey bees, their susceptibility to spinosad toxicity is high and direct application to areas of blooming plants can be expected to result in a high bee kill.

Aquatic species are at very low risk of adverse effects. The calculated concentration of spinosad in water is several orders of magnitude less than any concentration known to adversely affect aquatic organisms. Residues of spinosad are not expected to bioconcentrate based upon the water solubility and short residual half-life in water.

### **Endangered and Threatened Species**

Although no endangered or threatened species reside within the current program eradication zone, several endangered or threatened species are found in other parts of Los Angeles County and adjacent areas of Orange County. If the program were to expand and if the range of federally listed species and the treatment area overlapped, protective measures may be required to protect species from adverse environmental consequences of the program. The species that could require protection during control efforts are dependent upon the control methods used (i.e., not all control methods affect all species equally). Thus, protective measures will vary depending on the control method being used and the species found within the treatment area.

Spinosad bait spray is not selective for Medfly alone. Ingestion of spinosad by insects other than Medfly could result in their deaths. If their habitats overlapped with the program treatments, those species could be adversely affected by aerial application of spinosad bait. Repeated aerial sprays of spinosad bait generally would reduce insect numbers. Reduction of insect populations could reduce pollinator species for threatened and endangered plants, and would reduce potential food resources for endangered and threatened insectivores. Spinosad is not expected to affect any aquatic species or habitats, but potential effects to susceptible terrestrial invertebrates and their habitats must be considered if endangered and threatened species are present.

### **3. Diazinon Soil Treatments**

#### **a. Fate**

Technical grade diazinon is a sweet, aromatic, amber-brown liquid. The program formulation is applied at a rate of 5 pounds active ingredient per acre. Its half-life in soil ranges from 1.5 to 10 weeks and in water at neutral pH ranges from 8 to 9 days. Small amounts of diazinon are used to treat soil within the drip line of trees that have fruit infested with Medfly larvae. Surface vegetation may retain residues and, depending on soil type, local hydrology, and topography, diazinon may occur in runoff water.



## **b. Toxicity**

Although diazinon is widely used and generally is not considered a hazard to human health under its registered uses, it can be toxic to humans. EPA has classified the formulation of diazinon as category II (Warning) for program use in soil treatment. Although not a primary dermal or eye irritant, it can be absorbed through these routes and, at high concentrations or prolonged exposure, causes severe irritation.

The mode of toxic action of diazinon occurs through inhibition of the enzyme, acetylcholinesterase. Symptoms of poisoning in humans, who are much less susceptible to the effects of diazinon than insects, include blurred vision, nausea, vomiting, slurred speech, and mental confusion. Death, which can occur from high doses, results from respiratory arrest caused by muscle paralysis and bronchoconstriction. Accidental oral poisonings have resulted in death from doses between 50 and 500 mg/kg.

Diazinon has many metabolites, but toxicity data on most are not currently available. Although the metabolite diazoxon is more toxic than diazinon, it is also more easily metabolized and excreted. Diazinon may exhibit synergistic effects with other commercial pesticide formulations currently in use. Diazinon is not considered to be a carcinogen and is nonmutagenic.

Animals differ in their sensitivity to diazinon, both within and between species. Toxicity varies widely and depends on sex and life stage (table 5). Diazinon is toxic to vertebrate laboratory animals and very toxic to livestock. Diazinon is extremely toxic to birds, which are sensitive because their blood has no enzymes to hydrolyze diazoxon (a toxic metabolite), as does mammalian blood (Eisler, 1986). Signs of intoxication include salivation, stiff-legged gaits, wing spasms, and wing-beat convulsions (Hudson et al., 1984). Many incidents of avian (particularly geese and other waterfowl) mortality on golf courses have occurred because of the use of granular formulations of diazinon. These incidents led EPA to cancel use of diazinon on golf courses and sod farms in 1986. Some terrestrial invertebrates (such as bees) are extremely sensitive to diazinon. Diazinon causes high earthworm mortality but does not have a similar effect on nematodes.

Freshwater cladocerans (water fleas, common to aquatic areas) are among the aquatic species most sensitive to diazinon; *Gammarus fasciatus* has a 96-hour LC<sub>50</sub> of 0.20 grams per liter. There is some evidence that juvenile fish are more sensitive than eggs. Sublethal effects include reduced growth and reproduction in both marine and freshwater invertebrates, including reduced emergence of insects

(Eisler, 1986). Algae are unaffected by concentrations fatal to aquatic invertebrates.

**Table 5. Acute Oral LD<sub>50</sub>s<sup>1</sup> for Selected Species Dosed with Diazinon (mg/kg)**

Rabbit	130
Mouse	80 -135
Female rat	76 - 250
Male rat	108 - 285
Guinea pig	280
Calf	0.5
Starling	110
Mallard (3 to 4 months old)	3.5
Pheasant (3 to 4 months old)	4.3
Bobwhite quail	3.4 - 10
Chicken (5 days old)	8.4
Redwinged blackbird	2.0
Butterfly	8.8
Honey bee	0.372/bee

<sup>1</sup>LD<sub>50</sub> = Lethal dose for 50% of animals treated

### c. Exposure and Risk

#### Humans

Potential exposure to humans is by ingestion or dermal absorption. The soil drenching application (rate of 52 mg per square foot of treated area) techniques prevent inhalation exposure. Because the diazinon is watered into the soil and the drenched area is small, public exposure will be limited. Program use of the pesticide precludes exposure to residues from produce on host plants because any fruit will be stripped from the plants before treatment. Occupational exposure will be reduced by wearing gloves when handling or applying diazinon. The only human health risk associated with diazinon is the consumption of soil from the drenched area by toddlers. The public will be notified when a drench has occurred and will be advised of the necessary precautions.

#### Nontarget Species

Diazinon exposure to nontarget organisms is restricted to those organisms that traverse or visit the treated area as well as relatively immobile species that inhabit

the area directly treated. The treatments are limited (generally less than 10 gallons per year) and occur only within the drip line of host trees. However, due to diazinon's high toxicity, organisms that are directly exposed are at high risk. Limiting exposure will reduce this risk.

## **Endangered and Threatened Species**

Because birds are highly mobile and are among the most sensitive vertebrates to diazinon, endangered and threatened avian species are of special concern. No endangered or threatened species are known to reside within the current eradication zone. However, if the program were to expand, the limited nature of the soil treatments and implementation of appropriate protective measures would combine to protect federally listed endangered and threatened bird species.

Diazinon is used only to treat soil under hosts that are infested with Medfly larvae. This means that very little is used in a program (usually less than 10 gallons annually, for a combined area of under 2 acres). Therefore it is unlikely that endangered and threatened birds would even encounter any treatments.

Endangered and threatened birds may be protected from exposure to diazinon by presence of program personnel who remain in the area until the pesticide has soaked into the soil. Program monitoring may include carcass searches to ensure that no endangered and threatened species are affected by the program. If there is any confirmation that the program has adversely affected an endangered and threatened species, immediate action would be taken to determine an appropriate program response that would be required to protect those species.

It is anticipated that swift initiation of eradication activities upon detection of a Medfly infestation will minimize the area requiring treatment and make it unlikely that treatments will occur where endangered and threatened species are present. Recent Medfly infestations have occurred in urban and suburban areas where natural areas are small and endangered and threatened species are few or absent. Additionally, the incorporation of protective measures should further protect endangered and threatened species from potential adverse effects attributable to program eradication activities.

### **4. Methyl Bromide Fumigation**

#### **a. Fate**

Methyl bromide is an odorless, colorless, volatile gas which is three times as heavy as air. Its half-life is 3 to 7 days. Methyl bromide is released when a fumigation chamber is aerated. Because methyl bromide is heavier than air, the gas can collect

in isolated pockets, which could create hazardous conditions when there is little air circulation or mixing, such as during thermal inversions or periods of low wind.

## **b. Toxicity**

Methyl bromide gas and liquid are acutely toxic to humans. Contact with liquid or vapors can cause serious skin or eye injury. Inhalation can cause acute illness, including pulmonary edema (fluid buildup in the lungs), gastrointestinal distress, and convulsions which can be fatal. The LD<sub>50</sub> (lethal dose for 50% of animals treated) of rats to methyl bromide is 2,700 ppm for a 30-minute exposure. In humans, 1,583 ppm (6.2 mg/L (milligrams per liter)) methyl bromide is lethal after 10 to 20 hours of exposure and 7,890 ppm (30.9 mg/L) is lethal after 1½ hours of exposure (EPA, 1986). EPA has derived an RfC (reference concentration) of 0.48 mg/m<sup>3</sup> (milligrams per cubic meter) for general population exposure to methyl bromide (EPA, 1992).

Methyl bromide is rapidly absorbed by the lungs and affects both the lungs and kidneys. Increased exposure to methyl bromide results in elevation of bromine levels in the blood; poisoning symptoms occur at a level of 2.8 mg/100 ml of blood (Curley, 1984). Symptoms of acute exposure typically are headache, dizziness, visual problems, gastrointestinal disturbances, and respiratory problems. In more extreme cases, muscular pain, numbness, or twitching precede convulsions, unconsciousness, and possibly death.

Chronic exposure can result in behavioral changes, loss of ability to walk, neurological damage, and renal and liver function disturbances (Verberk et al., 1979). Because there are a number of toxicity data gaps, the chronic and subchronic toxicity of methyl bromide is not well characterized. For this reason, and the implication of its contribution to ozone depletion, EPA has issued a call-in notice to provide this information for reregistration. Manufacturers must supply more information.

Based on laboratory studies of the effects of methyl bromide inhalation and ingestion, nontarget species of mammals and birds exhibit symptoms similar to humans: weakness, lack of muscular coordination, neurological and behavioral abnormalities, and death from high doses. Due to its restricted use as a fumigant, wild animals are rarely exposed to methyl bromide and toxicity data is limited to farm animals. Residues in hay ranging from 6,800 to 8,400 ppm caused symptoms of intoxication in cattle, horses, and goats (Knight and Costner, 1977).

## **c. Exposure and Risk**

### **Humans**

Inhalation is the primary exposure route for methyl bromide. Concentrations of methyl bromide are electronically monitored during the fumigation. Because the gas is odorless and nonirritating during exposure and the onset of symptoms is delayed, leaks and spills causing extreme exposure can occur without persons being aware of its presence. Protective clothing and self-contained breathing apparatus are worn whenever concentrations of methyl bromide are anticipated to reach or exceed 5 ppm. The American Conference of Governmental Industrial Hygienists (ACGIH) has established exposure standards (Threshold Limit Value) of 5 ppm (20 mg/m<sup>3</sup>) to protect against adverse neurotoxic and pulmonary effects (ACGIH, 1990). Dermal exposure to workers could occur in the unlikely event of a spill of liquid methyl bromide.

Ingestion of methyl bromide residues and its degradation products is a third exposure route. Following aeration of the commodity, the small amount of methyl bromide that remains dissipates and degrades, leaving only inorganic bromide residues. However, residues from the methyl bromide fumigation will remain on the commodity. EPA tolerances for residues of methyl bromide, measured as inorganic bromides (40 CFR 180.123), range from 5 ppm (for apples, pears, and quinces) to 240 ppm (for popcorn), with most commodities at 50 ppm or less. Ingestion of these small amounts of residues is considered to have no toxicological effect.

The Natural Resources Defense Council previously petitioned EPA to classify methyl bromide as a class I ozone depleting chemical; the petitioners also requested reduction of its manufacture by 50% in 1992, and complete elimination of manufacture by January 1, 1993. EPA is expected to require the phase-out of most uses of methyl bromide by 2005. The relative importance of methyl bromide to ozone depletion, however, is subject to fundamental uncertainties.

Workers will have little exposure to methyl bromide because fumigations are contained. The public will be restricted from access to the fumigation chamber by a 30-foot wide barrier zone. Residues in fumigated commodities will be within tolerance limits. There is very little risk to human health from a methyl bromide fumigation.

## **Nontarget Species**

Few nontarget species will be exposed to methyl bromide directly. The aeration duct will deliver a plume which will disperse quickly. Species within this plume, such as insects which inadvertently fly in, might die. However, these effects are restricted to areas within the 30-foot wide barrier zone (Bergsten, personal communication). In addition, ground-dwelling organisms immediately outside the fumigation chamber are not anticipated to survive.

## **Endangered and Threatened Species**

Fumigation chambers are generally located in high traffic areas; tarped fumigations occur in agricultural areas. These areas are highly disturbed and are very unlikely to harbor endangered and threatened species. Therefore, it is not likely that endangered or threatened species will be exposed to methyl bromide fumigation.

### **5. Cumulative Impacts**

Cumulative impacts are those impacts, either direct or indirect, that result from incremental impact of the program action when added to other past, present, and reasonably foreseeable future actions. It is difficult to quantitatively predict the cumulative impacts for a potential emergency program in an environmental assessment such as this. The impacts can be considered from a subjective perspective.

Some chemicals, when used together, have been shown to act in a manner that produces greater toxicity than would be expected from the addition of both. This effect is known as potentiation or synergism. Malathion bait spray and diazinon could be applied during the same treatment regimen. Because malathion has frequently been observed as one constituent of a potentiating pair of organophosphorus insecticides (Murphy, 1980), synergistic effects from the combination of malathion and diazinon (both organophosphorus insecticides) could occur. However, malathion bait spray is applied to the tree canopy and diazinon to the soil within the drip line of the canopy, so synergistic effects are limited to animals that are active on both foliage and soil. In addition, the restriction of diazinon treatments to plants with infested fruits make it unlikely that any animals would get concurrent exposure to both insecticides. The mechanism of toxic action of spinosad is unique and different from other registered agrochemicals. It is, therefore, unlikely that synergism or potentiation of the toxicity of spinosad could occur through exposure to other chemicals.

Impacts from implementation of the program are expected to be temporary with potential adverse effects ending shortly after the infestation is eradicated. No bioaccumulation or environmental accumulation of malathion, diazinon, or spinosad is foreseen due to its rapid degradation rates. In contrast, the ongoing applications expected from the no action alternative would be expected to have cumulative effects. Therefore, any cumulative impacts of the program are expected to be less than those that might occur under the no action alternative, an alternative which most likely would result in escalating use of pesticides by the public.

Because the eradication may require the simultaneous use of malathion bait spray and diazinon, both of which are organophosphate cholinesterase inhibitors, there could be cumulative effects of using two pesticides. The history of the eradication efforts for the Medfly, as well as other fruit fly species, shows that this use pattern does not result in adverse effects to the general resident population nor the workers. Because most nontarget species are mobile, it is unlikely that an individual will be exposed to more than one treatment. In addition, diazinon treatments are restricted to locations where Medfly larvae are detected. Domestic animals and less mobile organisms, such as those dwelling near the soil surface, could be exposed.

In terms of the cumulative effects of pesticide use from the proposed action with pesticide use from other fruit fly programs, the small area requiring treatment for this program should not substantially increase exposure to workers, public, or nontarget species.

## **6. Methods to Reduce Risk**

Human pesticide exposure would be primarily to workers, especially in the case of the soil drench pesticide, diazinon, or methyl bromide which is used only in certified fumigation chambers or under tarpaulins (enclosures). Residents within the eradication area will be exposed to malathion or spinosad bait spray and diazinon to an extent depending on where the pesticides are applied. The public could be exposed to residues on any treated material moved out of the eradication area.

Current worker safety measures protect fumigators and other pesticide applicators from excessive exposure to methyl bromide, diazinon, malathion, and spinosad during routine operations. To minimize worker exposure to methyl bromide, the fumigation chamber is opened only after concentrations are reduced below 5 ppm. Proper sealing of fumigation enclosures and proper aeration facilitates dispersal of the fumigant. Diazinon exposure of workers can be prevented by gloves and safety goggles, which are indicated as protective clothing requirements on the label (Meister, 1990). Studies on exposure to diazinon during yard applications reveal that 85% of the exposure to workers is to their hands. Dermal exposure of workers to malathion and spinosad can also be substantially reduced by the use of

protective clothing. Written public notification will provide information about the schedule for pesticide treatments and applications, and specific precautions that residents should take to avoid excessive exposure, such as remaining indoors during malathion bait spray applications or diazinon soil treatments, and that malathion-treated produce should not be harvested for 3 days after application. However, individuals with greater sensitivity to cholinesterase inhibitors, spinosad, or the protein bait may need to take extra precautions to avoid even minimal exposure.

The program, properly implemented, represents a relatively low risk to human health except for extremely sensitive individuals who have had problems with similar programs in the past. However, this assessment does contain uncertainties associated with toxicity data gaps and estimations of exposure. Furthermore, synergistic interactions between the pesticides which could be used in this program as well as other pesticides not associated with the program and possibly used in the same area could increase toxicity and the associated risk. Potential risk will be substantially diminished due to the localized nature and short duration of the program.

Risks to nontarget organisms can be reduced by limiting exposure. If aerial applications are conducted, beekeepers and backyard pond owners should be notified. A survey of water bodies within the treatment area should be conducted and mapped so they will be avoided by establishing “no treatment” zones during aerial operations. Ground application of malathion bait spray poses little direct risk. Pet owners should be notified to limit animals’ exposure to treated trees. Soil treatments pose more risk due to higher toxicities and a barrier or other safeguards should be used. Timing of the treatment should be considered to reduce exposure. Standard operating procedures for methyl bromide fumigations include fencing or other barriers to limit access to fumigation and aeration area, which precludes exposure of many vertebrates.

The FWS or the California Natural Diversity Data Base will be consulted if the program area is expanded to ensure that endangered or threatened species are not adversely impacted.

The potential environmental impacts of the program’s alternatives and component treatment methods have been discussed and analyzed in detail within the EIS and associated analyses (including the “Biological Assessment, Medfly Cooperative Eradication Program—August 1993”) and the spinosad risk assessments. In addition, potential cumulative impacts were analyzed within the EIS. Refer to the EIS and the analyses it cites for greater detail.



## **7. Site-specific Issues**

This environmental analysis focuses on site-specific issues and conditions, especially with respect to any effects they might have on potential environmental impacts. Issues of concern associated with this proposed action include (1) potential effect on human health from chemical pesticide applications, (2) potential effect on wildlife (including endangered and threatened species) from program activities and treatments, and (3) potential effect on environmental quality.

The area of the proposed program has urban and suburban characteristics. The current eradication zone (where eradication treatments will occur) is the area including and immediately surrounding the Medfly detections—an area approximately 14 square miles (fig. 1). The current quarantine zone (where regulatory treatments may be required) includes the eradication zone and extends farther, for a total of approximately 30 square miles. The eradication zone is predominantly residential with many apartment buildings. At the time of the preparation of this EA, there are no sensitive sites within the treatment zone. However, expansion of the program area could place some sensitive sites within the quarantine zone. The Los Angeles River is presently east of the program area. The Angeles National Forest is to the north. The Memorial Coliseum and Sports Arena are within the program area. The program has adjusted treatments in the spray areas to minimize human exposures through the use of ground applications rather than aerial applications. If the treatment zone should expand in the future to include the state reservation and amusement parks, appropriate protection measures will be employed to avoid adverse impacts to these areas.

Consistent with Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” APHIS considered the potential for disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. In general, the population of this area is diverse and lacks any special characteristics that differ from those described in the EIS. There are, however, some areas that have minority communities within the county. In particular, there are several large Mexican-American communities nearby. Pertinent documents (environmental documents, precautions, and/or warnings) will be translated into Spanish for dissemination in these areas, and application schedules will be provided to radio stations and other media in Spanish. The potential for continuing expansion of the treatment area could result in potential exposure of many different communities to treatment chemicals, but there is no evidence that any one population is likely to have disproportionate effects from these program activities.

APHIS also recognizes that a proportion of the population may have unusual sensitivity to certain chemicals or environmental pollutants and that program

treatments pose higher dangers for these individuals. Consistent with Executive Order 13045, "Protection of Children From Environmental Health Risks and Safety Risks," APHIS considered the potential for disproportionately high and adverse health or safety effects to children. The potential risks from potential program actions were determined to pose no excess risk to children. Special notification procedures and precautions, as stated in the EIS's recommended mitigations, are required and serve to minimize the risks to individuals and groups considered to have potential for increased sensitivity.

The alternatives were compared with respect to their potential to affect local nontarget species. Paralleling the findings for human health, we have determined that a well-coordinated eradication program using IPM technologies would result in the least use of chemical pesticides overall with minimal adverse impact to nontarget species. The no action alternative, both suppression alternatives, and the Medfly eradication (no chemicals) alternative, all would be expected to result in broader and more widespread use of pesticides by homeowners and commercial growers, with correspondingly greater potential for adverse impact.

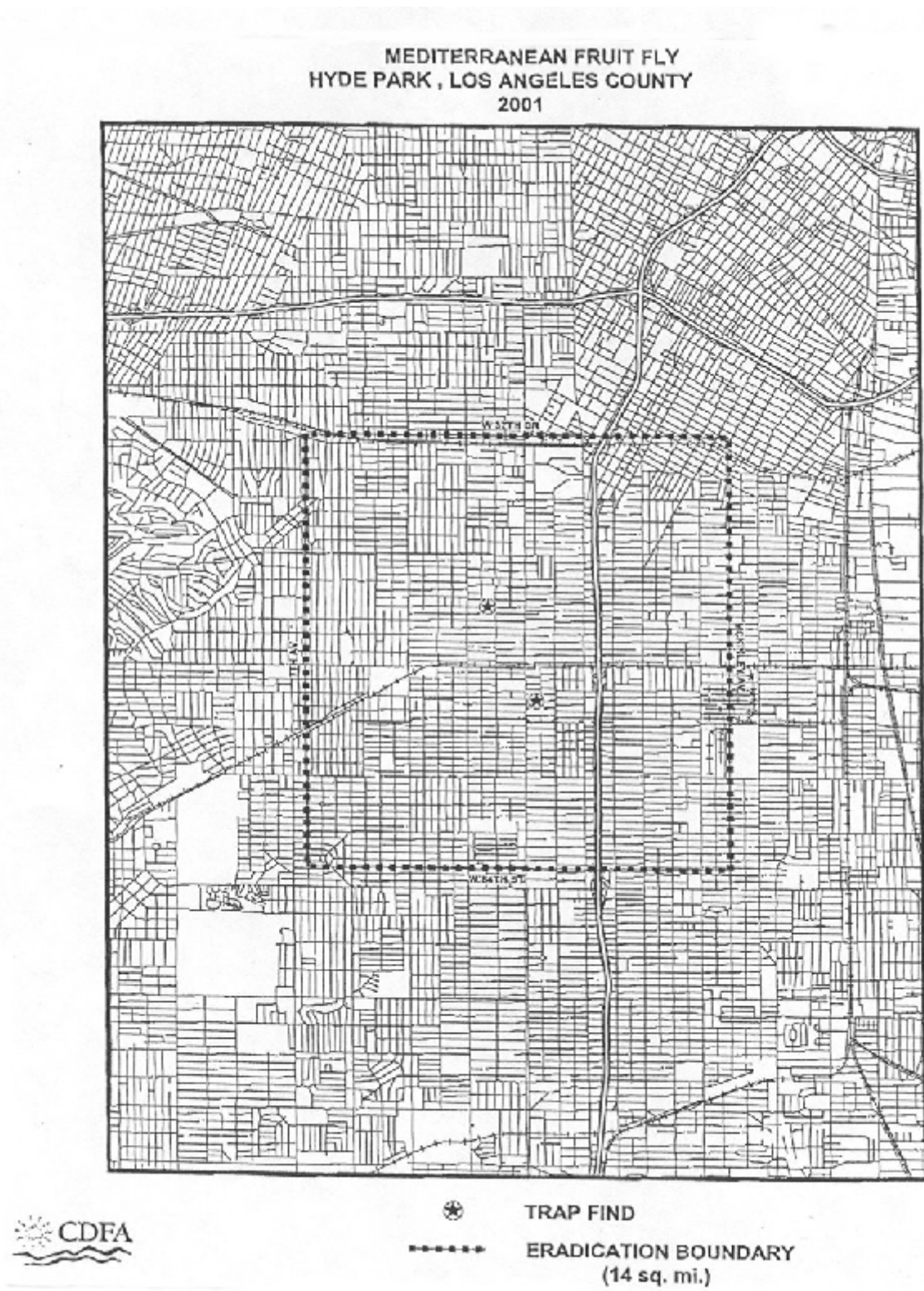
APHIS has consulted with the U.S. Department of the Interior, Fish and Wildlife Service (FWS), under the provisions of section 7 of the Endangered Species Act of 1973. APHIS has prepared a biological assessment for the Medfly Cooperative Eradication Program and FWS has concurred with APHIS' no effect determination, predicated on APHIS' adherence to specific protective measures. California Natural Diversity Database indicates that no endangered or threatened species reside within the current eradication zone. However, endangered and threatened species occur in other parts of Los Angeles County and parts of adjacent Orange county. If the program expands into other areas of those counties, and if there is a potential for affecting federally listed or proposed endangered and threatened species, APHIS will consult with FWS over protective measures that may be required. No adverse impacts to endangered or threatened species, or their habitats, are foreseen.

The area was considered with respect to any special characteristics that would tend to influence the effects of program operations. Potentially sensitive areas have been identified, considered, and accommodated through special selection of control methods and use of specific mitigative measures. The present program area contains no special characteristics that would require a departure from the standard operating procedures and mitigative measures that were described in the EIS.

In conclusion, the majority of the risk in the program is associated with pesticide use. Pesticide exposure and subsequent risk to humans and nontarget species is not

expected to be substantial in this program because of the localized nature of the infestation, the limited use of pesticides, the precise targeting of pesticides, and the safety procedures employed. Although minimal exposure could pose higher risk to some sensitive individuals and some nontarget organisms, pesticide exposure is generally expected to be minimal and program standard operating procedures and mitigations (especially notifications) serve to minimize that risk. Risk to environmental quality is considered minimal. No significant cumulative impacts are expected as a consequence of the proposed program or its component treatment methods.

Figure 1. Map of Eradication Zone



#### **IV. Listing of Agencies and Persons Consulted**

California Department of Food and Agriculture  
Department of Plant Industry  
Sacramento, California

U.S. Department of Agriculture  
Animal and Plant Health Inspection Service  
Plant Protection and Quarantine  
Invasive Species and Pest Management  
4700 River Road, Unit 134  
Riverdale, MD 20737-1236

U.S. Department of Agriculture  
Animal and Plant Health Inspection Service  
Policy and Program Development  
Environmental Services  
4700 River Road, Unit 149  
Riverdale, Maryland 20737-1238

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**Finding of No Significant Impact  
for  
Mediterranean Fruit Fly Cooperative Eradication Program  
Hyde Park (Los Angeles County), California  
Environmental Assessment,  
September 2001**

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), has prepared an environmental assessment (EA) that analyzes potential environmental consequences of alternatives for eradication of the Mediterranean fruit fly, an exotic agricultural pest that has been found in the Hyde Park area of Los Angeles County, California. The EA, incorporated by reference in this document, is available from—

U.S. Department of Agriculture  
Animal and Plant Health Inspection Service  
Plant Protection and Quarantine  
Western Regional Office  
9580 Micron Avenue, Suite 1  
Sacramento, CA 95827

**or**

U.S. Department of Agriculture  
Animal and Plant Health Inspection Service  
Plant Protection and Quarantine  
Invasive Species and Pest Management  
4700 River Road, Unit 134  
Riverdale, MD 20737-1234

The EA analyzed alternatives of (1) no action, (2) nonchemical control, and (5) Medfly eradication (including chemicals). Each alternative was determined to have potential environmental consequences. APHIS selected Medfly eradication (including chemicals), using an integrated pest management approach for the proposed program because of its capability to achieve eradication in a way that also reduces the magnitude of those potential environmental consequences. Program standard operational procedures and mitigative measures serve to negate or reduce the potential environmental consequences of this program.

APHIS has prepared a programmatic biological assessment for endangered and threatened species. The California Natural Diversity Database indicates that no endangered or threatened species reside within the current eradication zone. Should the program expand to areas where endangered and threatened species occur, APHIS will adhere to protective measures designed specifically for this program and mutually agreed upon with U.S. Fish and Wildlife Service.

I find that implementation of the proposed program will not significantly impact the quality of the human environment. I have considered and based my finding of no significant impact on the quantitative and qualitative risk assessments of the proposed pesticides and on my review of the program's operational characteristics. In addition, I find that the environmental process undertaken for this program is entirely consistent with the principles of "environmental justice," as expressed in Executive Order No. 12898 and protection of children as expressed in Executive Order No. 13045. It is expected that the program will pose no disproportionate adverse impacts to minority populations, low-income populations, or children. Lastly, because I have not found evidence of significant environmental impact associated with this proposed program, I further find that an environmental impact statement does not need to be prepared and that the program may proceed.

/s/  
\_\_\_\_\_  
Helene Wright  
State Plant Health Director - California  
Plant Protection and Quarantine  
Animal and Plant Health Inspection Service

9/11/01  
\_\_\_\_\_  
Date